

## § 170.174

or towboat, must be shown by design calculations to comply with—

(1) Paragraph (b) or (c) of this section if the maximum righting arm occurs at an angle of heel less than or equal to 30 degrees; or

(2) Paragraph (b) of this section if the maximum righting arm occurs at an angle of heel greater than 30 degrees.

(b) Each vessel must have—

(1) An initial metacentric height (GM) of at least 0.49 feet (0.15 meters);

(2) A righting arm (GZ) of at least 0.66 feet (0.20 meters) at an angle of heel equal to or greater than 30 degrees;

(3) A maximum righting arm that occurs at an angle of heel not less than 25 degrees;

(4) An area under each righting arm curve of at least 10.3 foot-degrees (3.15 meter-degrees) up to an angle of heel of 30 degrees;

(5) An area under each righting arm curve of at least 16.9 foot-degrees (5.15 meter-degrees) up to an angle of heel of 40 degrees or the downflooding angle, whichever is less; and

(6) An area under each righting arm curve between the angles of 30 degrees and 40 degrees, or between 30 degrees and the downflooding angle if this angle is less than 40 degrees, of not less than 5.6 foot-degrees (1.72 meter-degrees).

(c) Each vessel must have—

(1) An initial metacentric height (GM) of at least 0.49 feet (0.15 meters);

(2) A maximum righting arm that occurs at an angle of heel not less than 15 degrees;

(3) An area under each righting arm curve of at least 16.9 foot-degrees (5.15 meter-degrees) up to an angle of heel of 40 degrees or the downflooding angle, whichever is less;

(4) An area under each righting arm curve between the angles of 30 degrees and 40 degrees, or between 30 degrees and the downflooding angle if this angle is less than 40 degrees, of not less than 5.6 foot-degrees (1.72 meter-degrees); and

(5) An area under each righting arm curve up to the angle of maximum righting arm of not less than the area determined by the following equation:

$$A=10.3+0.187 (30 - Y) \text{ foot-degrees}$$

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$$A=3.15+0.057 (30 - Y) \text{ meter-degrees}$$

where—

A=area in foot-degrees (meter-degrees).

Y=angle of maximum righting arm, degrees.

(d) For the purpose of demonstrating compliance with paragraphs (b) and (c) of this section, at each angle of heel a vessel's righting arm is calculated after the vessel is permitted to trim free until the trimming moment is zero.

(e) For the purpose of demonstrating acceptable stability on the vessels described in § 170.170(d) as having unusual proportion and form, compliance with paragraphs (a) through (d) of this section or the following criteria is required:

(1) For partially protected routes, there must be—

(i) Positive righting arms to at least 35 degrees of heel;

(ii) No down flooding point to at least 20 degrees; and

(iii) At least 15 foot-degrees of energy to the smallest of the following angles:

(A) Angle of maximum righting arm.

(B) Angle of down flooding.

(C) 40 degrees.

(2) For protected routes, there must be—

(i) Positive righting arms to at least 25 degrees of heel;

(ii) No down flooding point to at least 15 degrees; and

(iii) At least 10 foot-degrees of energy to the smallest of the following angles:

(A) Angle of maximum righting arm.

(B) Angle of down flooding.

(C) 40 degrees.

[CGD 79-023, 48 FR 51010, Nov. 4, 1983, as amended by CGD 85-080, 61 FR 944, Jan. 10, 1996; CGD 95-028, 62 FR 51218, Sept. 30, 1997; 62 FR 51353, Sept. 30, 1997; USCG-2007-0030, 75 FR 78084, Dec. 14, 2010]

### Subpart F—Determination of Lightweight Displacement and Centers of Gravity

#### § 170.174 Specific applicability.

This subpart applies to each vessel for which the lightweight displacement and centers of gravity must be determined in order to do the calculations required in this subchapter.